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DISCUSSION OF  
POLLUTION ABATEMENT POLICY  
(*Published in March, 1950*)

By J. E. McKee, Elwood L. Bean, and  
Thomas C. Camp

SANITARY ENGINEERING DIVISION

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## DISCUSSION

J. E. McKee,<sup>2</sup> M. ASCE.—There can be no serious difference of opinion concerning the basic premises in this paper, inasmuch as the author advocates a sane, sensible approach to the pollution abatement problem in each individual stream. It is well to emphasize again that each stream is an entity unto itself and that each stream must be studied thoroughly to determine its capacity to absorb polluting substances without deleterious effects on the waters and other uses of the stream.

In that part of the United States west of the 100th meridian west longitude, the critical or minimum stream flow is zero for many days of each year and hence the liquid wastes discharged to dry streams percolate into the beds and travel underground. In other instances, industries and municipalities discharge wastes to spreading grounds to enable the liquid to percolate to the ground-water basins. This procedure does not eliminate all problems of pollution abatement; on the contrary, it merely transfers them from the surface streams to well-defined underground streams or to ground-water basins, and it transforms them in the character of their pollution.

As Mr. Camp states, for surface streams:

"The two most important characteristics of polluted waters which bear on their use are their contents of coliform bacteria and dissolved oxygen."

In underground streams and basins, however, coliform bacteria and pathogenic organisms are seldom a problem inasmuch as they are quickly and effectively diminished by the filtering action of the soil. Dissolved oxygen, although it may be desirable, can seldom be maintained in underground water, and its presence in appreciable concentration is not as critical as it is in surface streams. On the other hand, the end products of organic decomposition, such as nitrates, may accumulate in ground-water basins and may lead to concentrations harmful from the viewpoint of methemoglobinemia and possibly other diseases; or, toxic elements, such as chromium and boron, which may be continually swept away in surface streams, will be given a chance to build up to harmful concentrations in ground-water basins. The decomposition of raw wastes, or of residual organic matter in treated wastes, may not only deplete the dissolved oxygen in the ground water, but may also generate a reducing atmosphere that will allow iron, manganese, calcium, and other substances to be leached from the soil, thereby causing a deterioration of ground-water quality. In considering pollution abatement policy, therefore, engineers in the arid West must reckon with ground-water pollution as seriously as with surface-water pollution.

NOTE.—This paper by Thomas R. Camp was published in March, 1950. The numbering of footnotes in this Separate is a continuation of the consecutive numbering used in the original paper.

<sup>2</sup> Associate Prof. of San. Eng., California Inst. of Technology, Pasadena, Calif.; Affiliate, Camp, Dresser and McKee, Cons. Engrs., Boston, Mass.

Fortunately, many of the principles outlined by Mr. Camp are sufficiently broad to be applied equally well to surface water and ground water.

The suggestion that all polluters of a given stream " \* \* \* should be assessed in proportion to the amount of polluting matter each produces, whether their wastes are treated or not" is well taken. In effect it means that each polluter should buy a share in the natural purifying capacity of the stream, and that these shares should be used to provide waste treatment and other types of pollution abatement where the most good can be accomplished at the minimum cost. The abatement works may be owned by a public agency, such as a district or authority, as Mr. Camp suggests, and thereby gain certain advantages of financing and tax reduction. However, those persons who object to the encroachment of public ownership on private industry may still prefer to have treatment plants owned and operated by individual firms, especially where industrial wastes rather than municipal sewage contribute most of the pollution. In this case, all industries along a given stream or in a given drainage basin could form an "association" that would act as a financial clearing house. Each industry would pay into the association an annual sum in proportion to the strength and quantity of its pollution, and the association, in turn, would reimburse those industries which have installed and are operating treatment works. Where industries and municipalities must share the purifying capacity of a stream, the state health department, or other water pollution control agency as the case may be, can allot to each municipality and to the association of industries a certain capacity at each point on the stream. The association, in turn, can determine which industries should treat their wastes and to what extent.

ELWOOD L. BEAN,<sup>3</sup> Assoc. M. ASCE.—The author has very wisely stated (under the heading, "Forming a Policy") that, as the first step in policy making, the control agency should " \* \* \* designate the appropriate uses of each public watercourse or part thereof and to set standards of suitable water quality," indicating a stream zoning plan. He also stated (under the heading "Optimum Enforcement") that "Pollution control policy should be so developed as to permit the selection of wastes for treatment and \* \* \* wastes which may be discharged untreated \* \* \*." These are essential elements of any economical plan, and, although they do introduce hurdles, they must be met, just as the right to discharge waste "must be defended."

In determining the degree of purification required under such plans a mid-course must be followed. It is not right that complete treatment of all wastes be required; on the other hand, in setting up such plans, the treatment required must be such that stream purification capacity is not closely approached at any period. If this state is approached, increased industry (in number or capacity) or residential increases, may quickly necessitate reallocations requiring higher degrees of treatment from existing polluters, thereby burdening them with revisions or expansions.

In connection with the discussion of "Equitable Assessment of Costs," several items may well be emphasized. There are many industries which find

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that they can recover large percentages of the cost of waste treatment. These are frequently the industries that have been the most objectionable to downstream water users.

Where stream-quality zoning is practiced the downstream polluter is allowed to discharge greater amounts of pollution, therefore reducing his waste treatment costs below those of the upstream polluter; but, on the other hand, a compensating factor frequently exists since this polluter frequently obtains his water supply from the river and therefore is subjected to increased costs on water supply purification, or he obtains his water from other sources at costs much greater than the industries in the upstream locations.

With reference to methods of assessment, the author has indicated that the sewer service charge is inadequate in relation to charges for wastes. He indicates that it would be desirable to " \* \* \* assess in proportion to the B.O.D. and the suspended solids produced." The wording, however, makes no mention of the fact that very complete formulas for charges on such bases are already in use at Columbus, Ohio, Buffalo, N. Y., Elizabeth City, N. J., Philadelphia, Pa., and other municipalities.

The author has suggested that a "public agency" could save industry considerable sums of money by constructing and operating waste treatment works. True, the amortization of construction costs would be reduced; however, individual works would generally have to be established and operated by the public body on lands now owned by the industries. No very appreciable savings could be expected in such individual cases. Where industries are concentrated, generally sewage treatment works are established by the municipality. Such public works are generally justified in accepting and treating industrial wastes after the industry has made such adjustments as are necessary. Encouragement should be given industry by legislation, such as allowing the deduction of money spent for treatment plants in computing net incomes. The advantages and savings that could result from such legislation do not justify the development of far-flung public construction and operating agencies. Such a policy of public works development, in the opinion of the writer, is neither justifiable nor desirable.

THOMAS R. CAMP,<sup>4</sup> M. ASCE.—Valuable discussions were contributed by Messrs. McKee and Bean. The matter of high level policy is of utmost importance because of the current interest in the formulation of sound national policies for the development of water resources in the United States. The writer is in full agreement with the recommendations of the Committee on Water Resources Policy of the Engineers Joint Council that control and administration of water resources should be at the lowest governmental level consistent with the task. In the case of pollution control, a stream or drainage basin must be considered as a whole if pollution is to be abated at the least over-all cost. Thus districts, states, or interstate agencies are indicated as the proper control agencies. It is not necessary that the federal government act as anything more than a fact-finding agency.

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<sup>4</sup> Camp, Dresser & McKee, Cons. Engrs., Boston, Mass.

As stated by Mr. McKee, for many days throughout the year, the surface flow in streams in the southwestern part of the United States is zero. This condition results in very severe requirements for pollution abatement works. In these arid or semi-arid regions water is extremely valuable and ground water, wherever attainable, is used to capacity. There is a growing tendency to discharge wastes to spreading grounds for ultimate reclamation from the ground water. Hence, the degree of treatment required in such cases depends on the requirements of the spreading areas and the ultimate reuse of ground water.

To those who object to the idea of ownership of industrial waste treatment works by a public agency such as a district or city, Mr. McKee offers a substitute in the form of an association of industries along a given stream or within a given drainage basin. Mr. Bean objects to ownership of industrial waste treatment works by a public agency because the works might have to be constructed on lands now owned by the industries. Such lands could be purchased, of course, or taken by eminent domain from the industries if they are the only lands suitable for the treatment works. Mr. Bean is of the opinion that the advantages and savings that could result from public ownership and operation of industrial waste treatment works do not justify the development of far-flung public construction and operating agencies. The writer is ready to agree with Mr. Bean if politics is permitted to enter into the organization and operation of the agency. On the other hand, if a coordinated plan for the entire river basin is not worked out, for both construction and operation, there is little chance of obtaining best economy by joint treatment works and by selection of only a part of the wastes for treatment. Without unified control it is most likely that all industries will be required to treat whether treatment is necessary or not. If control by a public agency threatens to be political, perhaps some kind of cooperative undertaking can be devised whereby the industries share in the management in proportion to cost or in proportion to volume or strengths of wastes produced.

Mr. Bean suggests that, in determining the degree of treatment required, a mid-course should be followed so that the stream purification capacity is not closely approached at any period. Such a factor of safety is a desirable ideal, but in many cases it is not practical except at exorbitant expense. In fact, there are some cases where the use classification of the waters must be graded downward because of the economic impracticability of meeting higher standards. In the writer's opinion each case must be studied on its own merits. In some cases a factor of safety can be provided, but in others less than an ideal solution must be accepted.

The writer is aware that assessments in proportion to the biochemical oxygen demand and suspended solids content as well as in proportion to rates of flow are in effect in some municipalities. The practice is not at all general, however, and it is much more common for sewer rental charges to be set up in proportion to flow only. In some states there is no legal authority for sewer service charges on any other basis than rates of sewage flow. Where sewage and industrial wastes are treated jointly, it is essential to consider strength as well as volume if the charges are to be equitable.





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